CLAIMS:

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What is claimed is:

A reduced sensitivity spin valve sensor apparatus,
comprising:

a spin valve sensor; and

at least one magnetic effect inducing device, wherein the at least one magnetic effect inducing device induces a magnetic field to the spin valve sensor to thereby reduce a sensitivity of a free layer of the spin valve sensor to applied magnetic fields

- 1 2. The reduced sensitivity spin valve sensor apparatus
- of claim 1, wherein the at least one magnetic effect
- 3 inducing device is at least one permanent magnet.
- 1 3. The reduced sensitivity spin valve sensor apparatus
- of claim 1, wherein the at least one magnetic effect
- 3 inducing device is a pair of permanent magnet stabilizing
- 4 elements.
- 1 4. The reduced sensitivity spin valve sensor apparatus
- of claim 1, wherein the at least one magnetic effect
- 3 inducing device is magnetized in a longitudinal direction
- 4 parallel to the free layer of the spin valve sensor.
- 1 5. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 3, wherein the permanent magnet stabilizing
- 3 elements are cobalt-platinum/chromium magnets.

- 1 6. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 1, wherein the at least one magnetic effect
- 3 inducing device reduces the spin valve sensor's
- 4 propensity to saturate.
- 1 7. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 1, wherein the at least one magnetic effect
- 3 inducing device is an antiferromagnet layer.
- 1 8. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 7, wherein the antiferromagnet layer aligns
- 3 atomic moments in the free layer of the spin valve
- 4 sensor.
- 1 9. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 8, wherein the aligned atomic moments generate a
- 3 longitudinal exchange induced bias field in the free
- 4 layer that reduces the sensitivity of the free layer to
- 5 applied magnetic fields.
- 1 10. The reduced sensitivity spin valve sensor apparatus,
- 2 further comprising:
- 3 at least one insulating film; and
- at least one magnetic shield, wherein the insulating
- 5 film is one of alumina, silicon nit pide and aluminum
- 6 nitride.
- 1 11. A method of making a reduced sensitivity spin valve
- 2 sensor apparatus, comprising:
- 3 providing a spin valve sensor; and

providing at least one magnetic effect inducing 4

- device, wherein the at least one magnetic effect inducing 5
- device induces a magnetic field to the spin valve sensor 6
- to thereby reduce a sensitivity of a free layer of the 7
- spin valve sensor to applied magnetic fields. 8
- The method of making a reduced sensitivity/spin 1
- valve sensor apparatus of claim 11, wherein the at least 2
- 3 one magnetic effect inducing device is at least one
- 4 permanent magnet.
- The method of making a reduced sensitivity spin 1
- 2 valve sensor apparatus of claim 11, wherein the at least
- one magnetic effect inducing device is a pair of 3
- permanent magnet stabilizing elements. 4
- The method of making a reduced sensitivity spin 1 14.
- 2 valve sensor apparatus of claim 11, wherein the at least
- one magnetic effect inducing device is/magnetized in a 3
- 4 longitudinal direction parallel to the free layer of the
- 5 spin valve sensor.
- 15. The method of making a reduced sensitivity spin 1
- valve sensor apparatus of claim 13/ wherein the permanent 2
- 3 magnet stabilizing elements are c\(\phi \) balt-platinum/chromium
- magnets. 4
- The method of making a reduced sensitivity spin 1
- valve sensor apparatus of claim 11, wherein the at least 2



3 one magnetic effect inducing device reduces the spin

4 valve sensor's propensity to saturate.

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1 17. The method of making a reduced sensitivity spin

2 valve sensor apparatus of claim 11, wherein the at 1east

3 one magnetic effect inducing device is an antiferr ϕ magnet

4 layer.

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- 1 18. The method of making a reduced sensitivity spin
- 2 valve sensor apparatus of claim 17, wherein the
- 3 antiferromagnet layer aligns atomic moments in the free
- 4 layer of the spin valve sensor.

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- 1 19. The method of making a reduced sensitiv/ty spin
- 2 valve sensor apparatus of claim 18, wherein/the aligned
- 3 atomic moments generate a longitudinal exchange induced
- 4 bias field in the free layer that reduces the sensitivity
- 5 of the free layer to applied magnetic fields.

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- 1 20. The method of making a reduced sensitivity spin
- 2 valve sensor apparatus of claim 11, further comprising:
- 3 providing at least one insulating film; and
- 4 providing at least one magnetic/shield, wherein the
- 5 insulating film is one of alumina, silicon nitride and
- 6 aluminum nitride.

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- 1 21. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 1, wherein the at least one magnetic effect
- 3 inducing device includes a pair of antiferromagnetic
- 4 layers.

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- 1 22. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 21, wherein the pair of antiferromagnetic la∳ers
- 3 includes an antiferromagnetic layer that pins a
- 4 ferromagnetic layer at zero degrees relative to a 1/ong
- 5 axis of the free layer.
- 1 23. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 21, wherein the pair of antiferromagnetic layers
- 3 includes an antiferromagnetic layer that pins
- 4 ferromagnetic layer at ninety degrees relative to a long
- 5 axis of the free layer.
- 1 24. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 21, wherein the pair of antiferromagnet layers
- 3 includes a first antiferromagnet layer pinned at zero
- 4 degrees relative to a long axis of the /free layer, and a
- 5 second antiferromagnet layer pinned at ninety degrees
- 6 relative to the long axis of the free layer.
- 1 25. The reduced sensitivity spin */alve sensor apparatus
- 2 of claim 24, wherein the first and second
- 3 antiferromagnetic layers have different blocking
- 4 temperatures.
- 1 26. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 21, further comprising a ferromagnetic layer
- spaced from the free layer by a nonmagnetic layer.
- 1 27. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 26, wherein a thackness of the nonmagnetic layer

- is used to control an amount of ferromagnetic exchange 3
- between the ferromagnetic layer and the free layer. 4
- The reduced sensitivity spin valve sensor apparatus 1
- of claim 27, wherein the thickness of the nonmagnetic .2
- layer is approximately between 10 and 25 Angstroms. 3
- The method of claim 11, wherein the at least one 1
- 2 magnetic effect inducing device is a pair of
- antiferromagnetic layers. 3
- The reduced sensitivity spin valve sensor apparatus 1
- of claim 29, wherein the pair of antiferromagnetic layers 2
- 3 includes an antiferromagnetic layer that pins a
- ferromagnetic layer at zero degrees relative to a long 4
- 5 axis of the free layer.
- The reduced sensitivity spin valve sensor apparatus 1
- of claim 29, wherein the pair of antiferromagnetic layers 2
- includes an antiferromagnetic layer that pins a 3
- ferromagnetic layer at ninety degrees relative to a long 4
- axis of the free layer. 5
- The reduced sensitivity spin/valve sensor apparatus 1
- of claim 29, wherein the pair of antiferromagnetic layers 2
- includes a first antiferromagnetic layer that pins a 3
- 4 first ferromagnetic layer at zero degrees relative to a
- long axis of the free layer, and a second 5
- 6 antiferromagnetic layer that pins a second ferromagnetic

- 7 layer at ninety degrees relative to the long axis of the
- 8 free layer.
- 1 33. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 32, wherein the first and second
- 3 antiferromagnetic layers have different blocking
- 4 temperatures.
- 1 34. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 11, further comprising a ferromagnetic layer
- 3 spaced from the free layer by a nonmagnetic layer.
- 1 35. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 34, wherein a thickness of the nonmagnetic layer
- 3 is used to control an amount of ferromagnetic exchange
- 4 between the ferromagnetic layer and the free layer.
- 1 36. The reduced sensitivity spin valve sensor apparatus
- 2 of claim 35, wherein the thickness of the nonmagnetic
- 3 layer is approximately between/10 and 25 Angstroms.